

Executive function deficits can lead to attentional impairments during alcohol dependence

May 20 2014

Previous research has shown that alcohol-dependent (AD) individuals exhibit frontal lobe abnormalities. A focus on memory-executive dysfunctions, however, has led to a neglect of several other high-level cognitive functions, such as attentional biases and deficits. A study of the integrity of three attentional networks – alerting, orienting, and executive control – among AD individuals has found that deficits in executive control are particularly pronounced.

Results will be published in the July 2014 online-only issue of *Alcoholism: Clinical & Experimental Research* and are currently available at Early View.

"Excessive drinking has a negative impact on brain structure and functioning, leading to neuronal loss and impaired functioning of several brain areas, particularly the frontal lobe or the anterior part of the brain, that is the prefrontal and frontal areas," said Pierre Maurage, a professor at the Université catholique de Louvain as well as corresponding author for the study. "These areas are notably responsible for higher cognitive functions, like the ability to plan, adapt or inhibit our behaviours according to changes in our environment. AD can impair these high-level cognitive functions, leading to maladapted behaviours, particularly an inability to inhibit alcohol consumption behaviours."

"Attention is of course a fundamental process of human cognition,"

observed Salvatore Campanella, professor of psychopathology at the University of Brussels, and research associate at the Belgian Fund of Scientific Research. "Moreover, it is true that attention may be subdivided in several sub-components, implemented in partially different neural networks. Therefore, investigating which attentional mechanisms are specifically affected by alcohol consumption is highly relevant at the clinical level, as different forms of attentional disabilities may be differently rehabilitated."

"Our study is the first to explore these attentional abilities in a systematic way, that is, on the basis of a validated model of attention and simultaneously exploring the three main networks related to attention," added Mauraage.

Mauraage and his colleagues recruited 30 detoxified AD individuals (22 men, 8 women) during the third week of their treatment from a detoxification center in Brussels, as well 30 "control" subjects who drank lightly (less than 10 alcohol units per week) and were matched for age, gender, and education. All participants completed the Attention Network Test, designed to test attentional alterations specifically related to the three attentional networks noted above.

"While earlier studies had described globally impaired attentional abilities in AD on the basis of unspecific tasks," said Mauraage, "we found that attention is not globally impaired in AD. Indeed, two attentional networks – alerting and orienting – present preserved functioning in AD, while deficits were found at the higher level of attentional network called executive control, specifically, executive functions and frontal lobe functioning. Importantly, this deficit seems related to the direct effects of the duration and intensity of AD on the frontal regions of the brain."

"In summary," added Campanella, "attentional abilities are not all

affected by alcohol consumption. The main problem induced by long-term [alcohol](#) abuse is an inability to detect and resolve the conflict between task-relevant stimulus and interference provoked by task-irrelevant stimuli: in other words, alcoholics have difficulties in engaging attention on pertinent stimuli, and disengaging attention from non-pertinent stimuli."

"Practically speaking, this means that the ability to correctly react and to orient one's attention to stimulations present in the environment, which is a crucial ability for everyday life, is still present in AD, but these attentional abilities are not correctly used because the deficit in executive control hampers the adaptive and efficient use of them," said Mauraage. "At the clinical level, it also shows that therapeutic programs should not [focus](#) on the rehabilitation of basic attentional features, because they are actually preserved, but rather on high-level executive functions like inhibition or impulsivity control in order to improve attention."

Campanella agreed that these findings will likely have a significant impact at the clinical level. "This study opens the door to further important questions, such as, how is the deficit shown in this study related to relapse? Is there a recovery after abstinence?"

"It is important that AD should no longer be considered as a pathological state involving a global and undifferentiated impairment of every psychological and cognitive ability used in everyday life," added Mauraage, "as this perception is pretty discouraging for the relatives and caregivers. While some crucial abilities are indeed impaired, particularly executive functions, others are preserved. This is a positive message, and these preserved abilities should be used as reliable bases for rehabilitation. Further, therapeutic programs should be developed to rapidly rehabilitate specifically impaired abilities, thus improving executive control and reducing risk of relapse."

Provided by Alcoholism: Clinical & Experimental Research

Citation: Executive function deficits can lead to attentional impairments during alcohol dependence (2014, May 20) retrieved 17 July 2024 from

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